

CLAIM AMENDMENTS

1. (Original) A semiconductor chip assembly, comprising:

a semiconductor chip that includes first and second opposing surfaces, wherein the first surface of the chip includes a conductive pad;

a conductive trace that includes a routing line and a pillar, wherein the pillar includes first and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar faces away from the routing line, the second surface of the pillar contacts the routing line, and the tapered sidewalls are adjacent to the first and second surfaces of the pillar and slant inwardly towards the first surface of the pillar;

a connection joint that electrically connects the routing line and the pad; and

an encapsulant that includes first and second opposing surfaces, wherein the first surfaces of the pillar and the encapsulant face in a first direction, the second surfaces of the pillar and the encapsulant face in a second direction opposite the first direction, the chip, the pillar and the encapsulant extend vertically beyond the routing line in the first direction, the pillar is disposed outside a periphery of the chip, the routing line extends laterally from the pillar towards the chip, the chip and the pillar are embedded in the encapsulant, the encapsulant does not cover the first surface of the pillar, and the conductive trace extends through the first surface of the encapsulant.

2. (Original) The assembly of claim 1, wherein the first surface of the chip faces in the first direction and the second surface of the chip faces in the second direction.

3. (Original) The assembly of claim 1, wherein the first surface of the chip faces in the second direction and the second surface of the chip faces in the first direction.

4. (Original) The assembly of claim 1, wherein the routing line extends vertically beyond the chip in the second direction.

5. (Original) The assembly of claim 1, wherein the routing line extends vertically beyond the pillar in the second direction.

1 6. (Original) The assembly of claim 1, wherein the routing line extends within and
2 outside the periphery of the chip.

1 7. (Original) The assembly of claim 1, wherein the routing line is disposed outside the
2 periphery of the chip.

1 8. (Original) The assembly of claim 1, wherein the routing line is an essentially planar
2 metal lead.

1 9. (Original) The assembly of claim 1, wherein the pillar is copper.

1 10. (Original) The assembly of claim 1, wherein the pillar has a conical shape.

1 11. (Original) The assembly of claim 1, wherein the first surface of the pillar extends
2 vertically beyond the chip in the first direction.

1 12. (Original) The assembly of claim 1, wherein the first surface of the pillar is laterally
2 aligned with the second surface of the chip.

1 13. (Original) The assembly of claim 1, wherein the first surface of the pillar extends
2 vertically beyond the encapsulant in the first direction.

1 14. (Original) The assembly of claim 1, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant.

1 15. (Original) The assembly of claim 1, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and the second surface of the chip.

1 16. (Original) The assembly of claim 1, wherein the second surface of the pillar extends
2 vertically beyond the chip in the second direction.

1 17. (Original) The assembly of claim 1, wherein the first and second surfaces of the pillar
2 are flat and parallel to one another, the first surface of the pillar has a first surface area, the
3 second surface of the pillar has a second surface area, and the first surface area is at least 20
4 percent smaller than the second surface area.

1 18. (Original) The assembly of claim 1, wherein the encapsulant covers the chip.

1 19. (Original) The assembly of claim 1, wherein the encapsulant does not cover the chip,
2 and the second surface of the chip is exposed.

1 20. (Original) The assembly of claim 1, wherein the first surface of the encapsulant is
2 laterally aligned with the second surface of the chip, and the second surface of the chip is
3 exposed.

1 21. (Original) The assembly of claim 1, wherein the connection joint is an electroplated
2 metal.

1 22. (Original) The assembly of claim 1, wherein the connection joint is an electrolessly
2 plated metal.

1 23. (Original) The assembly of claim 1, wherein the connection joint is solder.

1 24. (Original) The assembly of claim 1, wherein the connection joint is conductive
2 adhesive.

1 25. (Previously Presented) The assembly of claim 1, wherein the connection joint
2 includes a nickel layer and a gold layer, the nickel layer contacts the routing line and the pad, and
3 the gold layer is spaced from the routing line and the pad.

1 26. (Original) The assembly of claim 1, wherein the connection joint is a wire bond.

1 27. (Original) The assembly of claim 26, wherein the wire bond extends vertically beyond
2 the chip and the routing line in the first direction.

1 28. (Original) The assembly of claim 26, wherein the wire bond extends vertically beyond
2 the chip, the routing line and the pillar in the second direction.

1 29. (Original) The assembly of claim 1, including an insulative base that contacts the
2 routing line, and extends vertically beyond the chip, the routing line and the pillar in the second
3 direction.

1 30. (Original) The assembly of claim 29, wherein a through-hole extends through the
2 insulative base, and the connection joint extends into the through-hole.

1 31. (Original) The assembly of claim 1, including an insulative adhesive that
2 mechanically attaches the chip to the routing line and the pillar.

1 32. (Original) The assembly of claim 31, wherein a through-hole extends through the
2 adhesive, and the connection joint extends into the through-hole.

1 33. (Original) The assembly of claim 32, wherein the adhesive contacts and is
2 sandwiched between the routing line and the pad.

1 34. (Original) The assembly of claim 1, including a first terminal that contacts the first
2 surface of the pillar, extends vertically beyond the pillar in the first direction and is spaced from
3 the connection joint.

1 35. (Original) The assembly of claim 1, including a second terminal that contacts the
2 routing line, extends vertically beyond the routing line in the second direction and is spaced from
3 the connection joint.

1 36. (Original) The assembly of claim 1, including a first terminal that is plated on the first
2 surface of the pillar, extends vertically beyond the pillar in the first direction and is spaced from
3 the connection joint, and a second terminal that is plated on the routing line, extends vertically
4 beyond the routing line in the second direction and is spaced from the connection joint and the
5 first terminal.

1 37. (Original) The assembly of claim 36, including a first solder ball on the first terminal
2 and a second solder ball on the second terminal.

1 38. (Original) The assembly of claim 1, including a heat sink that is mechanically
2 attached to the chip, electrically isolated from the chip, overlapped by the chip and disposed
3 vertically beyond the chip in the second direction.

1 39. (Original) The assembly of claim 1, including a ground plane that is mechanically
2 attached to the routing line, electrically connected to the routing line, overlapped by the routing
3 line and disposed vertically beyond the routing line in the second direction.

1 40. (Original) The assembly of claim 1, wherein the assembly is devoid of wire bonds and
2 TAB leads.

1 41. (Original) A semiconductor chip assembly, comprising:
2 a semiconductor chip that includes first and second opposing surfaces, wherein the first
3 surface of the chip includes a conductive pad;
4 a conductive trace that includes a routing line and a pillar, wherein the pillar includes first
5 and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar
6 faces away from and is spaced from the routing line, the second surface of the pillar contacts and
7 faces towards the routing line, and the tapered sidewalls are adjacent to the first and second
8 surfaces of the pillar and slant inwardly towards the first surface of the pillar;
9 an insulative base that contacts the routing line;
10 a connection joint that contacts and electrically connects the routing line and the pad; and

11 an encapsulant that includes first and second opposing surfaces, wherein the first surfaces
12 of the pillar and the encapsulant face in a first direction, the second surfaces of the pillar and the
13 encapsulant face in a second direction opposite the first direction, the chip, the pillar and the
14 encapsulant extend vertically beyond the routing line and the connection joint in the first
15 direction, the pillar is disposed outside a periphery of the chip and extends across a thickness of
16 the chip between the first and second surfaces of the chip, the routing line extends laterally from
17 the pillar towards the chip, the chip and the pillar are embedded in the encapsulant, the
18 encapsulant does not cover the first surface of the pillar, the insulative base extends vertically
19 beyond the chip, the routing line and the pillar in the second direction, and the conductive trace
20 extends through the first surface of the encapsulant.

1 42. (Original) The assembly of claim 41, wherein the first surface of the chip faces in the
2 first direction and the second surface of the chip faces in the second direction.

1 43. (Original) The assembly of claim 41, wherein the first surface of the chip faces in the
2 second direction and the second surface of the chip faces in the first direction.

1 44. (Original) The assembly of claim 41, wherein the routing line is an essentially planar
2 metal lead that extends vertically beyond the chip and the pillar in the second direction.

1 45. (Original) The assembly of claim 41, wherein the first surface of the pillar extends
2 vertically beyond the chip in the first direction.

1 46. (Original) The assembly of claim 41, wherein the first surface of the pillar is laterally
2 aligned with the second surface of the chip.

1 47. (Original) The assembly of claim 41, wherein the first surface of the pillar extends
2 vertically beyond the encapsulant in the first direction.

1 48. (Original) The assembly of claim 41, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant.

1 49. (Original) The assembly of claim 41, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and the second surface of the chip.

1 50. (Original) The assembly of claim 41, wherein the second surface of the pillar extends
2 vertically beyond the chip in the second direction.

1 51. (Original) The assembly of claim 41, wherein the first and second surfaces of the
2 pillar are flat and parallel to one another, the first surface of the pillar has a first surface area, the
3 second surface of the pillar has a second surface area, and the first surface area is at least 20
4 percent smaller than the second surface area.

1 52. (Original) The assembly of claim 41, wherein the encapsulant covers the chip.

1 53. (Original) The assembly of claim 41, wherein the first surface of the encapsulant is
2 laterally aligned with the second surface of the chip, and the second surface of the chip is
3 exposed.

1 54. (Original) The assembly of claim 41, including an insulative adhesive that contacts
2 and is sandwiched between the chip and the insulative base.

1 55. (Original) The assembly of claim 54, wherein a through-hole extends through the
2 insulative base and the adhesive, and the connection joint extends into the through-hole.

1 56. (Original) The assembly of claim 55, wherein the adhesive contacts and is
2 sandwiched between the routing line and the pad.

1 57. (Original) The assembly of claim 41, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first
3 direction and is spaced from the connection joint, and a second terminal that is plated on the

4 routing line, extends vertically beyond the routing line and the encapsulant in the second
5 direction and is spaced from the connection joint and the first terminal.

1 58. (Original) The assembly of claim 57, including a first solder ball on the first terminal
2 and a second solder ball on the second terminal.

1 59. (Original) The assembly of claim 41, including a heat sink that is mechanically
2 attached to the insulative base, electrically isolated from the chip, overlapped by the chip and
3 disposed vertically beyond the insulative base in the second direction.

1 60. (Original) The assembly of claim 41, including a ground plane that is mechanically
2 attached to the insulative base, electrically connected to the routing line, overlapped by the
3 routing line and disposed vertically beyond the insulative base in the second direction.

1 61. (Original) A semiconductor chip assembly, comprising:

2 a semiconductor chip that includes first and second opposing surfaces, wherein the first
3 surface of the chip includes a conductive pad;

4 a conductive trace that includes a routing line and a pillar, wherein the pillar includes first
5 and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar
6 faces away from and is spaced from the routing line, the second surface of the pillar faces
7 towards and contacts the routing line, and the tapered sidewalls are adjacent to the first and
8 second surfaces of the pillar and slant inwardly towards the first surface of the pillar;

9 an insulative base that contacts the routing line;

10 an adhesive that contacts and is sandwiched between the chip and the insulative base;

11 a plated connection joint that contacts and electrically connects the routing line and the
12 pad in a through-hole that extends through the insulative base and the adhesive; and

13 an encapsulant that includes first and second opposing surfaces, wherein the first surfaces
14 of the pillar and the encapsulant and the second surface of the chip face in a first direction, the
15 first surface of the chip and the second surfaces of the pillar and the encapsulant face in a second
16 direction opposite the first direction, the chip, the pillar and the encapsulant extend vertically
17 beyond the routing line and the connection joint in the first direction, the pillar is disposed

18 outside a periphery of the chip, extends vertically at least as far as the chip in the first direction
19 and extends vertically beyond the chip in the second direction, the routing line extends laterally
20 from the pillar towards the chip, extends within and outside a periphery of the chip and extends
21 vertically beyond the chip and the pillar in the second direction, the chip and the pillar are
22 embedded in the encapsulant, the encapsulant contacts the chip, the pillar and the insulative base,
23 is spaced from the connection joint and does not cover the first surface of the pillar, the insulative
24 base extends vertically beyond the chip, the routing line and the pillar in the second direction,
25 and the conductive trace extends through the first surface of the encapsulant.

1 62. (Original) The assembly of claim 61, wherein the first surface of the pillar extends
2 vertically beyond the second surface of the chip in the first direction.

1 63. (Original) The assembly of claim 61, wherein the first surface of the pillar extends
2 vertically beyond the encapsulant in the first direction.

1 64. (Original) The assembly of claim 61, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and extends vertically beyond the second surface
3 of the chip in the first direction.

1 65. (Original) The assembly of claim 61, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and the second surface of the chip, and the
3 second surface of the chip is exposed.

1 66. (Original) The assembly of claim 61, wherein the first and second surfaces of the
2 pillar are flat and parallel to one another, the first surface of the pillar has a first surface area, the
3 second surface of the pillar has a second surface area, and the first surface area is at least 20
4 percent smaller than the second surface area.

1 67. (Original) The assembly of claim 61, wherein the adhesive contacts and is
2 sandwiched between the routing line and the pad.

1 68. (Original) The assembly of claim 61, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first
3 direction and is spaced from the connection joint, and a second terminal that is plated on the
4 routing line, extends vertically beyond the routing line and the encapsulant in the second
5 direction and is spaced from the connection joint and the first terminal.

1 69. (Original) The assembly of claim 61, including a heat sink that is mechanically
2 attached to the insulative base, electrically isolated from the chip, overlapped by the chip and
3 disposed vertically beyond the insulative base in the second direction.

1 70. (Original) The assembly of claim 61, including a ground plane that is mechanically
2 attached to the insulative base, electrically connected to the routing line, overlapped by the
3 routing line and disposed vertically beyond the insulative base in the second direction.

1 71. (Original) A semiconductor chip assembly, comprising:
2 a semiconductor chip that includes first and second opposing surfaces, wherein the first
3 surface of the chip includes a conductive pad;
4 a conductive trace that includes a routing line and a pillar, wherein the pillar includes first
5 and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar
6 faces away from and is spaced from the routing line, the second surface of the pillar faces
7 towards and contacts the routing line, and the tapered sidewalls are adjacent to the first and
8 second surfaces of the pillar and slant inwardly towards the first surface of the pillar;
9 an insulative base that contacts the routing line;
10 a bumped connection joint that contacts and electrically connects the routing line and the
11 pad; and
12 an encapsulant that includes first and second opposing surfaces, wherein the first surfaces
13 of the pillar and the encapsulant and the second surface of the chip face in a first direction, the
14 first surface of the chip and the second surfaces of the pillar and the encapsulant face in a second
15 direction opposite the first direction, the chip, the pillar and the encapsulant extend vertically
16 beyond the routing line and the connection joint in the first direction, the pillar is disposed
17 outside a periphery of the chip, extends vertically at least as far as the chip in the first direction

18 and extends vertically beyond the chip in the second direction, the routing line extends laterally
19 from the pillar towards the chip, extends within and outside a periphery of the chip and extends
20 vertically beyond the chip and the pillar in the second direction, the chip and the pillar are
21 embedded in the encapsulant, the encapsulant contacts the chip, the pillar and the insulative base
22 and does not cover the first surface of the pillar, the insulative base extends vertically beyond the
23 chip, the routing line and the pillar in the second direction, and the conductive trace extends
24 through the first surface of the encapsulant.

1 72. (Original) The assembly of claim 71, wherein the first surface of the pillar extends
2 vertically beyond the second surface of the chip in the first direction.

1 73. (Original) The assembly of claim 71, wherein the first surface of the pillar extends
2 vertically beyond the encapsulant in the first direction.

1 74. (Original) The assembly of claim 71, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and extends vertically beyond the second surface
3 of the chip in the first direction.

1 75. (Original) The assembly of claim 71, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and the second surface of the chip, and the
3 second surface of the chip is exposed.

1 76. (Original) The assembly of claim 71, wherein the first and second surfaces of the
2 pillar are flat and parallel to one another, the first surface of the pillar has a first surface area, the
3 second surface of the pillar has a second surface area, and the first surface area is at least 20
4 percent smaller than the second surface area.

1 77. (Original) The assembly of claim 71, wherein the connection joint is a solder bump.

1 78. (Original) The assembly of claim 71, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first

3 direction and is spaced from the connection joint, and a second terminal that is plated on the
4 routing line, extends vertically beyond the routing line and the encapsulant in the second
5 direction and is spaced from the connection joint and the first terminal.

1 79. (Original) The assembly of claim 71, including a heat sink that is mechanically
2 attached to the insulative base, electrically isolated from the chip, overlapped by the chip and
3 disposed vertically beyond the insulative base in the second direction.

1 80. (Original) The assembly of claim 71, including a ground plane that is mechanically
2 attached to the insulative base, electrically connected to the routing line, overlapped by the
3 routing line and disposed vertically beyond the insulative base in the second direction.

1 81. (Original) A semiconductor chip assembly, comprising:
2 a semiconductor chip that includes first and second opposing surfaces, wherein the first
3 surface of the chip includes a conductive pad;
4 a conductive trace that includes a routing line and a pillar, wherein the pillar includes first
5 and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar
6 faces away from and is spaced from the routing line, the second surface of the pillar faces
7 towards and contacts the routing line, and the tapered sidewalls are adjacent to the first and
8 second surfaces of the pillar and slant inwardly towards the first surface of the pillar;
9 an insulative base that contacts the routing line;
10 an adhesive that contacts and is sandwiched between the chip and the insulative base;
11 a wire bond connection joint that electrically connects the routing line and the pad,
12 wherein the connection joint is electrically connected to the routing line in a first through-hole
13 that extends through the insulative base and is spaced from the adhesive, and the connection joint
14 is electrically connected to the pad in a second through-hole that extends through the insulative
15 base and the adhesive and is spaced from the first through-hole; and
16 an encapsulant that includes first and second opposing surfaces, wherein the first surfaces
17 of the pillar and the encapsulant and the second surface of the chip face in a first direction, the
18 first surface of the chip and the second surfaces of the pillar and the encapsulant face in a second
19 direction opposite the first direction, the chip, the pillar and the encapsulant extend vertically

20 beyond the routing line and the connection joint in the first direction, the pillar is disposed
21 outside a periphery of the chip, extends vertically at least as far as the chip in the first direction
22 and extends vertically beyond the chip in the second direction, the routing line extends laterally
23 from the pillar towards the chip and extends vertically beyond the chip and the pillar in the
24 second direction, the chip and the pillar are embedded in the encapsulant, the encapsulant
25 contacts the chip, the pillar and the insulative base, is spaced from the connection joint and does
26 not cover the first surface of the pillar, the insulative base extends vertically beyond the chip, the
27 routing line and the pillar in the second direction, and the conductive trace extends through the
28 first surface of the encapsulant.

1 82. (Original) The assembly of claim 81, wherein the first surface of the pillar extends
2 vertically beyond the second surface of the chip in the first direction.

1 83. (Original) The assembly of claim 81, wherein the first surface of the pillar extends
2 vertically beyond the encapsulant in the first direction.

1 84. (Original) The assembly of claim 81, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and extends vertically beyond the second surface
3 of the chip in the first direction.

1 85. (Original) The assembly of claim 81, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and the second surface of the chip, and the
3 second surface of the chip is exposed.

1 86. (Original) The assembly of claim 81, wherein the first and second surfaces of the
2 pillar are flat and parallel to one another, the first surface of the pillar has a first surface area, the
3 second surface of the pillar has a second surface area, and the first surface area is at least 20
4 percent smaller than the second surface area.

1 87. (Original) The assembly of claim 81, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first
3 direction and is spaced from the connection joint.

1 88. (Original) The assembly of claim 81, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first
3 direction and is spaced from the connection joint, and a second terminal that is plated on the
4 routing line, extends vertically beyond the routing line and the encapsulant in the second
5 direction, contacts the connection joint and is spaced from the first terminal.

1 89. (Original) The assembly of claim 81, including a heat sink that is mechanically
2 attached to the insulative base, electrically isolated from the chip, overlapped by the chip and
3 disposed vertically beyond the insulative base in the second direction.

1 90. (Original) The assembly of claim 81, including a ground plane that is mechanically
2 attached to the insulative base, electrically connected to the routing line, overlapped by the
3 routing line and disposed vertically beyond the insulative base in the second direction.

1 91. (Original) A semiconductor chip assembly, comprising:
2 a semiconductor chip that includes first and second opposing surfaces, wherein the first
3 surface of the chip includes a conductive pad;
4 a conductive trace that includes a routing line and a pillar, wherein the pillar includes first
5 and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar
6 faces away from and is spaced from the routing line, the second surface of the pillar faces
7 towards and contacts the routing line, and the tapered sidewalls are adjacent to the first and
8 second surfaces of the pillar and slant inwardly towards the first surface of the pillar;
9 an insulative base that contacts the routing line;
10 an adhesive that contacts and is sandwiched between the chip and the insulative base;
11 a wire bond connection joint that electrically connects the routing line and the pad; and
12 an encapsulant that includes first and second opposing surfaces, wherein the first surfaces
13 of the chip, the pillar and the encapsulant face in a first direction, the second surfaces of the chip,

14 the pillar and the encapsulant face in a second direction opposite the first direction, the chip, the
15 pillar, the connection joint and the encapsulant extend vertically beyond the routing line in the
16 first direction, the pillar is disposed outside a periphery of the chip and extends vertically beyond
17 the chip in the first and second directions, the routing line extends laterally from the pillar
18 towards the chip and extends vertically beyond the chip and the pillar in the second direction, the
19 chip and the pillar are embedded in the encapsulant, the encapsulant contacts the chip, the pillar,
20 the insulative base and the connection joint and does not cover the first surface of the pillar, the
21 insulative base extends vertically beyond the chip, the routing line and the pillar in the second
22 direction, and the conductive trace extends through the first surface of the encapsulant.

1 92. (Original) The assembly of claim 91, wherein the first surface of the pillar extends
2 vertically beyond the connection joint in the first direction.

1 93. (Original) The assembly of claim 91, wherein the first surface of the pillar extends
2 vertically beyond the encapsulant in the first direction.

1 94. (Original) The assembly of claim 91, wherein the first surface of the pillar is laterally
2 aligned with the first surface of the encapsulant and extends vertically beyond the connection
3 joint in the first direction.

1 95. (Original) The assembly of claim 91, wherein the first and second surfaces of the
2 pillar are flat and parallel to one another, the first surface of the pillar has a first surface area, the
3 second surface of the pillar has a second surface area, and the first surface area is at least 20
4 percent smaller than the second surface area.

1 96. (Original) The assembly of claim 91, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first
3 direction and is spaced from the connection joint.

1 97. (Original) The assembly of claim 91, including a second terminal that is plated on the
2 routing line, extends vertically beyond the routing line and the encapsulant in the second
3 direction and is spaced from the connection joint.

1 98. (Original) The assembly of claim 91, including a first terminal that is plated on the
2 first surface of the pillar, extends vertically beyond the pillar and the encapsulant in the first
3 direction and is spaced from the connection joint, and a second terminal that is plated on the
4 routing line, extends vertically beyond the routing line and the encapsulant in the second
5 direction and is spaced from the connection joint and the first terminal.

1 99. (Original) The assembly of claim 91, including a heat sink that is mechanically
2 attached to the insulative base, electrically isolated from the chip, overlapped by the chip and
3 disposed vertically beyond the insulative base in the second direction.

1 100. (Original) The assembly of claim 91, including a ground plane that is mechanically
2 attached to the insulative base, electrically connected to the routing line, overlapped by the
3 routing line and disposed vertically beyond the insulative base in the second direction.

1 101. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 chip is the only chip embedded in the encapsulant.

1 102. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein any
2 chip embedded in the encapsulant is electrically connected to the pillar by an electrically
3 conductive path that includes the routing line.

1 103. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein any
2 chip embedded in the encapsulant extends vertically beyond the routing line in the first direction.

1 104. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 pillar is copper and has a conical shape.

1 105. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 first and second surfaces of the pillar are flat and parallel to one another.

1 106. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 first and second surfaces of the pillar have a circular shape.

1 107. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 first surface of the pillar is concentrically disposed within a surface area of the second surface of
3 the pillar.

1 108. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 tapered sidewalls have a taper between 45 and slightly less than 90 degrees.

1 109. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 tapered sidewalls have a taper of approximately 75 degrees.

1 110. (Previously Presented) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the
2 pillar is copper and has a conical shape, the first and second surfaces of the pillar are flat and
3 parallel to one another and have a circular shape, and the first surface of the pillar is
4 concentrically disposed within a surface area of the second surface of the pillar.

1 111. (New) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the pillar is metal.

1 112. (New) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the pillar is a single-
2 piece metal.

1 113. (New) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the pillar is formed
2 subtractively.

1 114. (New) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the first surface of
2 the pillar contacts a terminal at an electroplated interface between different metals.

- 1 115. (New) The assembly of claims 1, 41, 61, 71, 81 or 91, wherein the second surface of
- 2 the pillar contacts the routing line at an electroplated interface between different metals.

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